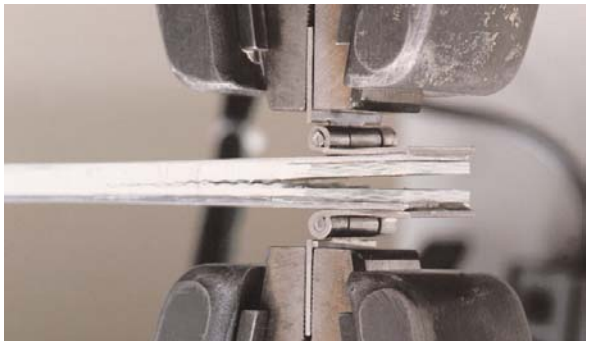
Mechanical Testing

Manufacturing Technologies

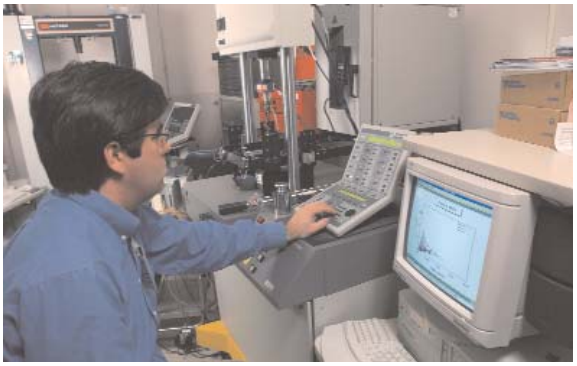
The Manufacturing Science and Technology Center provides scientists, engineers, designers, and computational modelers with a broad range of mechanical testing techniques. Measurements of mechanical properties, testing of components and small structures, validation of encapsulant cure stress models, development of fracture mechanics tests for use in adhesion studies and understanding the failure mechanism of adhesive interfaces are only a few of the activities in the mechanical testing arena. The department can develop an appropriate test structure, perform the test, analyze, and interpret the data for you.

Capabilities

- Test procedures and equipment are available for measuring tension, compression, torsion, shear, peel, flexure, fatigue, and fracture toughness properties of materials and structures.



Double cantilever beam fracture toughness test method



Servohydraulic load frame for cyclic load testing

- Auxiliary equipment and instrumentation in the mechanical test laboratory include environmental chambers (-300° F to 1100° F), strain gages, extensometers, Linear Variable Differential Transformers (LVDTs), and digital image correlation (DIC) software for full field displacement measurements.

Strain measurement during encapsulation

National Nuclear Security Administration

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company,for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Sandia National Laboratories

Mechanical testing of a small foam sample

Resources

- Instron 20 kip screw-driven test system
- Instron 5 kip servo-hydraulic test system
- MTS Axial-Torsion (75 kip/50,000 in-lb) test system
- Test Resources 300 lb screw-driven test system
- Rheometrics Solids Analyzer II and ARES DMA's for miniature samples
- Portable data acquisition equipment and sensors for offsite thermomechanical testing

Accomplishments

- Participated in combined analytical/experimental program to develop a cure stress model for predicting response during the curing process of epoxy systems used to encapsulate electronic components; developed experimental methods and performed laboratory tests to validate finite element calculations of strains that develop during cure.
- Developed and implemented experimental methods to aid in modeling the fracture behavior of interfaces and bulk materials. Results are being used in the development of a fracture methodology that can model time-dependent fracture initiation, crack path, and propagation rate in bulk materials and interfaces between dissimilar materials.
- Developed test methods and conducted tests to assess the aging and reliability of aluminum honeycomb bonding materials and interfaces.
- Investigated the aging and reliability of foam materials and solid encapsulants through the use of thermomechanical testing techniques.

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